

# ASSIGNMENT 1

Textbook Assignment: "Wave Propagation," chapter 1, pages 1-1 through 1-14.

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- 1-1. Which of the following factors can affect atmospheric conditions?
1. Geographic height
  2. Geographic location
  3. Changes in time
  4. All of the above
- 1-2. In what portion of the atmosphere does the majority of weather phenomena take place?
1. Ionosphere
  2. Stratosphere
  3. Troposphere
  4. Hydrosphere
- 1-3. Because the stratosphere is a relatively calm region with little or no temperature change, it will have almost no effect on radio wave propagation.
1. True
  2. False
- 1-4. Variations in the ionosphere resulting from changes in the sun's activity are known as
1. regular variations
  2. irregular variations
  3. both 1 and 2 above
  4. seasons
- 1-5. The regular variations in the ionosphere can be separated into how many classes?
1. One
  2. Two
  3. Three
  4. Four
- 1-6. In ionization, when an electron is knocked free from a neutral gas atom, what is the overall charge of the atom?
1. Negative
  2. Positive
  3. Neutral
  4. Inverted
- 1-7. The frequency of ultraviolet light passing through the atmosphere has what relationship to the ionospheric layer it ionizes?
1. It is inversely proportional
  2. It is directly proportional
  3. It is inversely proportional during the day and directly proportional at night
  4. It is directly proportional during the day and inversely proportional at night
- 1-8. What term best describes the process that returns positive ions to their original neutral state?
1. Refraction
  2. Recombination
  3. Ionization
  4. Polarization
- 1-9. At what approximate time of day is the density of the ionospheric layers at its lowest level?
1. Just before sunrise
  2. Mid-morning
  3. Afternoon
  4. Sunset
- 1-10. How many distinct layers make up the ionosphere?
1. One
  2. Two
  3. Three
  4. Four

- 1-11. At what frequencies does the combination of the earth's surface and the D layer act as a waveguide?
1. Vlf
  2. Lf
  3. Mf
  4. Hf
- 1-12. The D layer loses its absorptive qualities at frequencies above what level?
1. 30 MHz
  2. 20 MHz
  3. 10 MHz
  4. 3 MHz
- 1-13. What is the approximate range of the E layer above the earth's surface?
1. 30-54 miles
  2. 55-90 miles
  3. 91-130 miles
  4. 131-160 miles
- 1-14. Frequencies above what level pass through the E layer unaffected?
1. 50 MHz
  2. 100 MHz
  3. 150 MHz
  4. 200 MHz
- 1-15. During daylight hours, the F layer will divide into how many separate layers?
1. Five
  2. Two
  3. Three
  4. Four
- 1-16. Most high-frequency, long-range communications occur in what layer(s) of the ionosphere?
1. D
  2. E
  3. F
  4. H
- 1-17. Which of the following is NOT a factor for radio wave refraction?
1. Ionization density of the layer
  2. Frequency of the radio wave
  3. Angle of incidence
  4. Transmitter power
- 1-18. For any given ionized layer, the critical frequency is just below the escape point.
1. True
  2. False
- 1-19. The critical angle for radio wave propagation depends on what two factors?
1. Angle of incidence and layer density only
  2. Layer density and wavelength only
  3. Angle of incidence and wavelength only
  4. Wavelength and antenna height only
- 1-20. What term best describes the area located between the transmitting antenna and the point where the sky wave first returns to the earth?
1. Ground wave
  2. Skip zone
  3. Skip distance
  4. Ace area
- 1-21. Which of the following factors will affect the outer limits of the skip zone?
1. Frequency
  2. Sunspot activity
  3. Angle of transmission
  4. All of the above
- 1-22. Radio waves reflecting from the earth's surface or the ionosphere, 180 degrees out of phase, have what effect, if any, at the receiving station?
1. The signal will be weak or faded
  2. The signal will be stronger
  3. The signal will be garbled
  4. None

1-23. For ionospheric reflection to occur, the ionized layer must not be thicker than how many wavelengths of the transmitted frequency?

1. One
2. Two
3. Three
4. Four

1-24. The ability of radio waves to turn sharp corners and bend around obstacles is known as

1. reflection
2. refraction
3. diffraction
4. waveshaping

1-25. Which of the following definitions best describes a shadow zone?

1. The area of complete coverage at vlf frequencies
2. The area within the diameter of an obstruction
3. The area ranging the height of the obstruction
4. The area on the opposite side of the obstruction, in line-of-site from the transmitter to the receiver

1-26. What type of fading occurs for the longest amount of time?

1. Phase shift
2. Absorption
3. Multipath
4. Diffraction

1-27. Which of the following are examples of multipath radio wave transmissions?

1. Groundwaves
2. Ionospheric refractions
3. Reflection from the earth's surface
4. All of the above

1-28. Fading on the majority of the ionospheric circuits is a result of what particular type of fading?

1. Selective
2. Absorption
3. Multipath
4. Weather

IN ANSWERING QUESTIONS 1-29 AND 1-30, SELECT FROM THE FOLLOWING LIST THE DEFINITION OF THE INDICATED TERM.

- A. Two or more receiving antennas spaced apart to produce a usable signal
- B. Two or more receiving antennas of varying heights located together
- C. The use of two separate transmitters and receivers on different frequencies transmitting the same information
- D. The use of two separate transmitters and receivers on the same frequency transmitting the same information

1-29. Space diversity.

1. A
2. B
3. C
4. D

1-30. Frequency diversity.

1. A
2. B
3. C
4. D

1-31. A wide band of frequencies is transmitted and selective fading occurs. Which of the following statements best describes the effect of the fading on the signal?

1. It affects various frequencies
2. It can cause changes in phase and amplitude
3. It can cause severe distortion and limit total signal strength
4. All of the above

1-32. Which ionospheric layer is most dense during the winter?

1. E
2. D
3. F2
4. F1

- 1-33. During the 27-day sunspot cycle, which ionospheric layer experiences the greatest fluctuations in density?
1. D
  2. E
  3. F1
  4. F2

IN ANSWERING QUESTIONS 1-34 THROUGH 1-38, SELECT FROM THE FOLLOWING LIST THE DEFINITION OF THE INDICATED TERM.

- A. Depends on the angle of the sun; refracts hf waves during the day, up to 20 MHz, to distances of 1200 miles; greatly reduced at night
- B. Reflects vlf waves for long-range communications; refracts lf and mf for short-range communications; has little effect on vhf and above; gone at night
- C. Density depends on the angle of the sun; its main effect is absorption of hf waves passing through to the F2 layer
- D. Provides long-range hf communications; very variable; height and density change with time of day, season, and sunspot activity
- E. Structure and density depend on the time of day and the angle of the sun; consists of one layer at night and two layers during the day

1-34. D layer.

1. A
2. B
3. C
4. D

1-35. E layer.

1. A
2. B
3. C
4. E

1-36. F layer.

1. B
2. C
3. D
4. E

1-37. F1 layer.

1. A
2. B
3. C
4. D

1-38. F2 layer.

1. A
2. C
3. D
4. E

1-39. During periods of maximum sunspot activity within the eleven-year cycle, critical frequencies for all layers increase.

1. True
2. False

1-40. Which of the following problems is NOT a negative side effect of the sporadic E layer?

1. Causes increased multipath problems
2. Provides additional absorption
3. Blanks out more favorable layers
4. Increased static in line of sight communications

1-41. When sudden ionospheric disturbances (SID) occurs, which ionospheric layer is affected the most?

1. D
2. E
3. F1
4. F2

1-42. What effect do ionospheric storms have on (a) the range of frequencies and (b) the working frequency used for communications?

1. (a) Increase (b) increase
2. (a) Decrease (b) decrease
3. (a) Increase (b) decrease
4. (a) Decrease (b) increase

- 1-43. What form of precipitation has the greatest absorption effect on RF energy?
1. Fog
  2. Snow
  3. Rain
  4. Hail
- 1-44. The duct effect produced by temperature inversion allows for long-distance communications over what frequency band?
1. Vlf
  2. Lf
  3. Hf
  4. Vhf
- 1-45. Which of the following factors affect(s) the amount of ground reflection loss when a radio wave is reflected from the earth's surface?
1. Angle of incidence
  2. Ground irregularities
  3. Electrical conductivity at the point of reflection
  4. All of the above
- 1-46. As an RF wave increases in distance, the wavefront spreads out, reducing the amount of energy available within any given unit of area. This action produces what type of energy loss?
1. Absorption
  2. Ground reflection
  3. Freespace
  4. Spread
- 1-47. Radio waves above the MUF will experience what effect when refracted from the ionosphere?
1. They will fall short of the desired location
  2. They will overshoot the desired location
  3. They will be absorbed by lower layers
  4. They will experience multipath fading
- 1-48. Variations in the ionosphere may change a preexisting muf. This is especially true because of the volatility of which of the following layers?
1. F1
  2. F2
  3. D
  4. E
- 1-49. Radio waves that are propagated below the LUF are affected by what problem(s)?
1. Increased absorption
  2. Higher levels of atmospheric noise
  3. Higher rate of refraction
  4. All of the above
- 1-50. The frequency that will avoid the problems of multipath fading, absorption, noise, and rapid changes in the ionosphere is known by what term?
1. LUF
  2. MUF
  3. FOT
  4. LOS